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Abstract

ELECTRICITY SUPPLY AND THE ROLE OF NUCLEAR POWER IN CANADA

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1. Development, construction and operation of heavy-water-moderated and -cooled natural-uranium power reactors has proceeded successfully along the lines indicated at the 1958 Conference. The latest power cost estimates and details of construction of this CANDU family of reactors are reported in other papers at this Conference. Operating and construction experience, together with these estimates and designs, provide the basis for this paper.

2. It is interesting to compare forecasts of Canadian electricity demand and supply for the period 1955 - 1980 made at previous Conferences with the latest estimates and revised economic data. Installed capacity is above forecasts, and there have been significant developments in hydro-electric, fossil fuel and nuclear generation which have a major effect on the economics of each system.

3. Modern engineering considerations of river systems have increased the potential of individual hydroelectric schemes, and the now possible use of economic long-distance transmission lines has ensured the development of very large blocks of remotely located hydroelectric power for use at load centres at competitive prices, i.e., $\sim$4 mills/kWh with provincial government financing.

4. Fossil fuel for thermal generating stations is now cheaper and more readily available across most of Canada than previously. Larger and more efficient steam-raising units will therefore also produce electric power in the 4 mills/kWh range.

5. Our nuclear power reactor development has more than kept pace. Lower costs for fuel and special materials combined with projected economies arising from the construction and operation of very large plants promise electricity production at less than 4 mills/kWh. During the 1970's installation of nuclear generating stations should proceed as previously forecast.

6. About 1980 a very rapid increase in the proportion of nuclear generating to other types of stations being built seems likely for several reasons.

7. Forecasts show increasing demands for electricity and, by this time, the annual increments in every section of the country would be substantial.

8. The harnessing of the major obvious water power resources will be essentially complete, and significant areas are remote from sources of fossil fuel at very low prices.

9. On the other hand, the reduction of materials and operating costs will enable large nuclear stations to generate power more cheaply than originally planned, and new stations will still be falling in cost. Costs of special materials will be lower, and fuel costs should be both low and stable for a considerable period of time after 1980.

10. It will not be possible to make meaningful forecasts of nuclear fuel supplies available at such low prices until a truly commercial demand has been built up and has been operating for at least a few years (i.e., after 1980). Uranium, however, represents only a small component of the total cost of electricity generation in a CANDU system. Moreover, if its cost rises to double the figures predicted for the 1980's, fuel recycle and uranium-thorium convertor reactors will become competitive and stabilize the cost of electricity from these nuclear plants at a level that will not be significantly higher than predicted for the natural-uranium cycle with no reprocessing.